DOCUMENT RESUME

ED 324 193 SE 051 459

AUTHOR Howe, Robert W.; Warren, Charles R.
TITLE Teaching Critical Thinking through Environmental Education. ERIC/SMEAC Environmental Education Digest No. 2.
INSTITUTION ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Columbus, Ohio.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO EDO-SE-89-22
PUB DATE 89
CONTRACT RI88062006
NOTE 4p.
AVAILABLE FROM ERIC/SMEAC, The Ohio State University, 1200 Chambers Road, Room 310, Columbus, OH 43212 (1.00).
PUB TYPE Information Analyses - ERIC Information Analysis Products (071)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; *Critical Thinking; Elementary Secondary Education; *Environmental Education; *Science and Society; Science Education; Secondary School Science; *Teaching Methods
IDENTIFIERS ERIC Digests

ABSTRACT

The ability to think critically is essential if individuals are to live, work, and function effectively in a current and changing society. As adults, students will be living in a complex world and in a democracy where both individual and collective actions will require effective selection, processing, and use of information. National, state association, business, and industry reports on education produced in the 1980's called for increased emphasis on higher-order learning skills, including critical thinking skills. This digest includes: (1) a definition of critical thinking; (2) research findings concerning critical thinking; (3) a discussion of the role of environmental education in critical thinking instruction; (4) materials available for environmental education that emphasize critical thinking skills; and (5) assistance available to teachers wanting to modify instruction to emphasize critical thinking skills. A list of 14 references is included. (CW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED324193

TEACHING CRITICAL THINKING THROUGH ENVIRONMENTAL EDUCATION

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Robert W. Howe

and

Charles R. Warren

ERIC/SMEAC Environmental Education Digest, No. 2, 1989.

SE051459

ERIC Clearinghouse for Science, Mathematics, and Environmental Education

1200 Chambers Road, Third Floor
Columbus, Ohio 43212
(614) 292-6717

ERIC/SMEAC Environmental Education Digest EDO-SE-89-22 No. 2, 1989

TEACHING CRITICAL THINKING THROUGH ENVIRONMENTAL EDUCATION

The ability to think critically is essential if individuals are to live, work, and function effectively in our current and changing society.

Students must make choices, evaluations, and judgments every day regarding (1) information to obtain, use and believe, (2) plans to make, and (3) actions to take. As adults they will be living in a complex world and in a democracy where both individual and collective actions will require effective selection, processing, and use of information.

State and local curriculum guides contain goal and objective statements regarding the importance of critical thinking skills. National, state association, business and industry reports on education produced since 1983 have called for increased emphasis on higher-order learning skills, including critical thinking skills.

At the same time national and state evaluations have indicated a high percentage of students in American schools are not able to use critical thinking skills effectively. Business and industry continue to report that many employees are not able to think critically in job situations.

There is a profound difference between goals, objectives, and expectations and demonstrated achievement. Schools need to review what they are doing, what they are achieving, and ways to improve students' thinking abilities.

What is critical thinking?

Many definitions of critical thinking have been published. Ennis (1987) stated that it is the process and skills involved in rationally deciding what to do or what to believe.

Educational researchers and program developers (Costa, 1985; Keating, 1988) have tended to include four elements in reports and writings on critical thinking. These include (1) content knowledge (knowledge of the discipline), (2) procedural knowledge (knowledge of thinking skills), (3) ability to monitor, use and control thinking skills (metacognition), and (4) an attitude to use thinking skills and knowledge.

Critical thinking skills identified as important for various disciplines may differ, but skills common to most lists are identified by Winocut (Costa, 1985) and by the California State Department of Education.

Winocut's listing of skills (Costa, 1985) includes three categories: (1) enabling skills, (2) processes, and (3) operations. Enabling skills include observing, comparing/contrasting, grouping/labeling, categorizing/classifying, ordering, patterning, and prioritizing. Processes include skills related to analyzing questions, facts/opinion, relevancy of information, and reliability of information . Processes also include skills necessary for inferring, understanding meanings, cause/effect, making predictions, analyzing assumptions, and identifying points of view. Operations include logical reasoning, creative thinking, and problem solving skills.

The California State Department of Education model (Costa, 1985) includes most of the same skills organized into three categories: (1) Defining and clarifying the problem, (2) Judging information related to the problem, and (3) Solving problems/drawing conclusions.

What does research indicate regarding teaching critical thinking?

In general, data indicate that critical thinking skills are not learned well unless schools emphasize critical thinking and the use of critical thinking skills on a continuing basis .

Whether critical thinking is a generalized and a transferable skill, or whether it is bound up in the particulars of a specific content domain is still an issue to be resolved (Keating,1988). Glaser (1984) contends the latter is true and, further that the former perspective is based on an early and ultimately less useful model of human cognitive activity. Kuhn et. al. (1988), while recognizing strong evidence for domain-specificity, argue that mastery in some topic areas may lead to a subsequent ability to think critically in related areas. The necessity of integrating different sources of knowledge (Keating, 1988) is being recognized in most current research paradigms.

Based on research results in the science fields related to reasoning (Glaser, 1984; Carey, 1986; Kuhn, 1985), developing an understanding of knowledge and the ability to retrieve useful knowledge is important for effective thinking. Analyses of items from tests using Bloom's Taxonomy have produced similar conclusions; students are generally not able to effectively use thinking skills without appropriate knowledge.

Focusing directly on thinking skills and the development and use of thinking skills over time tends to produce more effective thinking than unplanned emphasis on skill development or short term emphasis. State education programs such as those in California emphasize the development of thinking skills throughout the curriculum and over time. Emphasis should be given to critical questioning, reading, writing, listening, and planning and carrying out activities in all curriculum areas.

There are many reasons to believe that the development of higher order reasoning rests squarely on the availability of ample amounts of relevant discourse (Glaser, 1984, Keating, 1988). This has not occurred on any regular basis in most middle, junior high, and senior high schools due to lack of teacher knowledge, lack of materials, class size and competing demands such as emphasis of tests, coverage of textbook content, and required academic content. Organizational

rearrangements which would dramatically reduce class size, at least for some proportion of the school day, would likely enhance the development of higher order thinking skills (Bennett, 1987).

The quality of discourse and the amount of student interaction are also important. There needs to be a shift in many classes, from a teacher-centered classroom to a student-centered classroom in which students can be involved in collecting and analyzing information, paired problem solving, cooperative learning settings, simulations, debates, and critical reporting sessions.

Providing experiences in real-life situations or situations that simulate real-life situations increases the probability that skills will be used. Providing modeling of the skills, ample opportunities for practice, and feedback on the effectiveness of the student's thinking are also important considerations. Selection of experiences should be based on the developmental levels of the students.

Why is environmental education an important focus for critical thinking and an effective mechanism to enhance critical thinking?

Current and anticipated environmental problems are receiving increased attention in the media, by all levels of government, by citizen groups, and by individuals concerned with the potential implications for humans and other life on Earth. These problems are local, regional, national, and international in scope. Developing workable solutions to environmental problems will require choices and decisions based on a critical examination of information and opinions.

Environmental education provides a good mechanism for developing critical thinking skills by (1) providing topics and problems that cut across the school curriculum and can enhance the integration of knowledge, (2) providing real problems that can be studied or simulated, and (3) by providing topics and problems that can be adjusted to the developmental levels of students.

What materials are available for environmental education that emphasize critical thinking skills?

While there are many environmental education materials available that include critical thinking skill development, there are several that provide for both a structure and a variety of activities and experiences. Examples of materials with many activities include *Aquatic Project Wild, Project Wild, Project Learning Tree, Class, Science-Technology-Society: Preparing for Tomorrow's World*, and *SuperSaver Investigators*.

An activity manual produced by ERIC/SMEAC (Howe and Disinger, 1990) includes examples of these and other materials. The manual also includes examples of activities you can design related to various environmental topics and problems. The activities provide a variety of effective instructional procedures (debates, simulations, critical analyses of materials and presentations, case studies, etc.), and focus on specific or combinations of critical thinking skills.

How can a teacher get help to modify instruction to emphasize thinking skills?

There are a variety of experiences and materials available to help teachers learn to teach critical thinking skills more effectively. *Project Wild* offers workshops for teachers to help them use materials more effectively. The Association for Supervision and Curriculum Development (ASCD) has produced some very useful materials to help teachers design a classroom structure and activities that are effective for teaching thinking skills. The book by Costa and others (1985) has been very helpful for many teachers and contains useful ideas for teaching thinking skills. ASCD also offers workshops that emphasize teaching thinking skills.

The Alliance for Environmental Education has established a Network of Centers for Environmental Education. These centers are located throughout the United States and are available to assist local schools and teachers in modifying curricula and instruction. For information regarding centers in your area contact the Alliance for Environmental Education, 10751 Ambassador Dr., Suite 201, Manassas, VA 22110, (703) 631-6754.

SELECTED REFERENCES

Bennett, S. *New Dimensions in Research on Class Size and Academic Achievement*. National Center on Effective Secondary Schools, University of Wisconsin, Madison, WI, 1987. ED 288 854.

Carey, S. "Cognitive Science and Science Education." *American Psychologist*, 41, p 1123-1130, 1986.

Costa, A. (ed). *Developing Minds: A Resource Book for Teaching Thinking*. Association for Curriculum and Supervision, Arlington, VA, 1985. ED 262 968.

Ennis, Robert. "A Taxonomy of Critical Thinking Dispositions and Abilities." In Joan Baron and Robert Sternberg (Eds.) *Teaching Thinking Skills: Theory and Practice*. W. H. Freeman, New York, 1987.

Glaser, R. E. "Education and Thinking: The Role of Knowledge," *American Psychologist*, 39, 93-104, 1984.

Howe, Robert W. and John F. Disinger. *Environmental Activities for Teaching Critical Thinking*. ERIC/SMEAC, Columbus, OH, 1990 (in press).

Iozzi, Louis A. *Science-Technology-Society: Preparing for Tomorrow's World*. Sopris West, Longmont, CO, 1987. ED 289 737.

Keating, Daniel. *Adolescents' Ability to Engage in Critical Thinking*, National Center for Effective Secondary Schools, Madison, WI, November, 1988. ED 307 508.

Kuhn, D., E. Amsel, and M. O'Loughlin. *The Development of Scientific Thinking Skills*, Academic Press, San Diego, CA, 1988.

Ohio Department of Natural Resources. *SuperSaver Investigators*, Ohio Department of Natural Resources, Columbus, OH, 1988. SE 051 286.

Project Learning Tree: Supplementary Activity Guide for Grades K through 6. The American Forest Institute, Inc., Washington, DC, 1975. ED 290 612.

Project WILD: Aquatic Education Activity Guide, Project WILD, Boulder, CO, 1987.

Project WILD: Elementary Education, Project WILD, Boulder, CO, 1983.

Resnick, L. B. and L. E. Klopfer. *Toward the Thinking Curriculum: Current Cognitive Research - 1989 ASCD Yearbook*, Association for Supervision and Curriculum Development, Alexandria, VA, 1989.

Prepared by
Robert W. Howe
Director
and
Charles R. Warren
Graduate Assistant

This digest was funded by the Office of Educational Research and Improvement, U.S. Department of Education under contract no. RI 88062006. Opinions expressed in this digest do not necessarily reflect the positions or policies of OERI or the Department of Education.